

Forces and Motion

Notes

Learning Objective: Through writing and speaking, SWBAT compare and contrast speed, velocity and acceleration using academic language.

Speed

distance traveled in a specific amount of time

The speed of an object depends on the how much force is used to move it

Examples of speed

- 100 meters per second (m/s)
- 65 kilometers per hour (km/h)





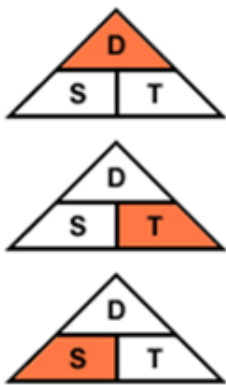
S = 30 km/h



S = 30 km/h

Formula to
calculate speed

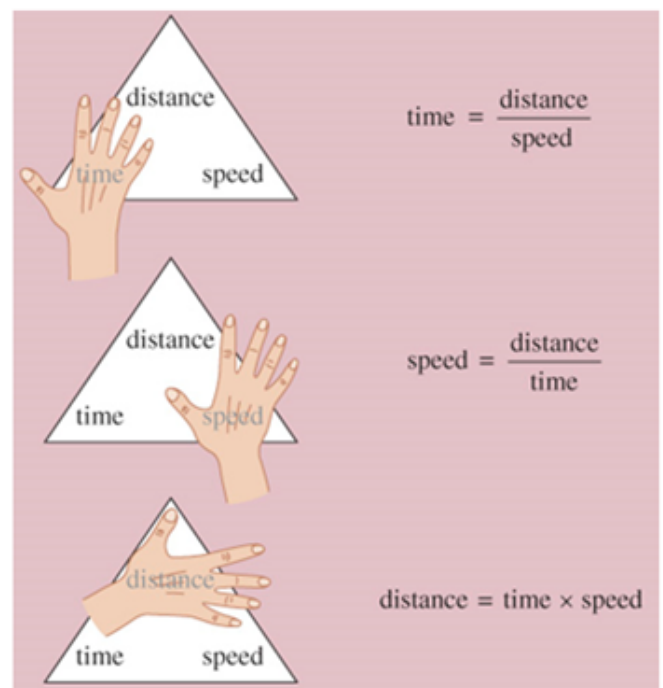
speed = distance ÷ time



Distance = Speed x Time

Time = $\frac{\text{Distance}}{\text{Speed}}$

Speed = $\frac{\text{Distance}}{\text{Time}}$



time = $\frac{\text{distance}}{\text{speed}}$

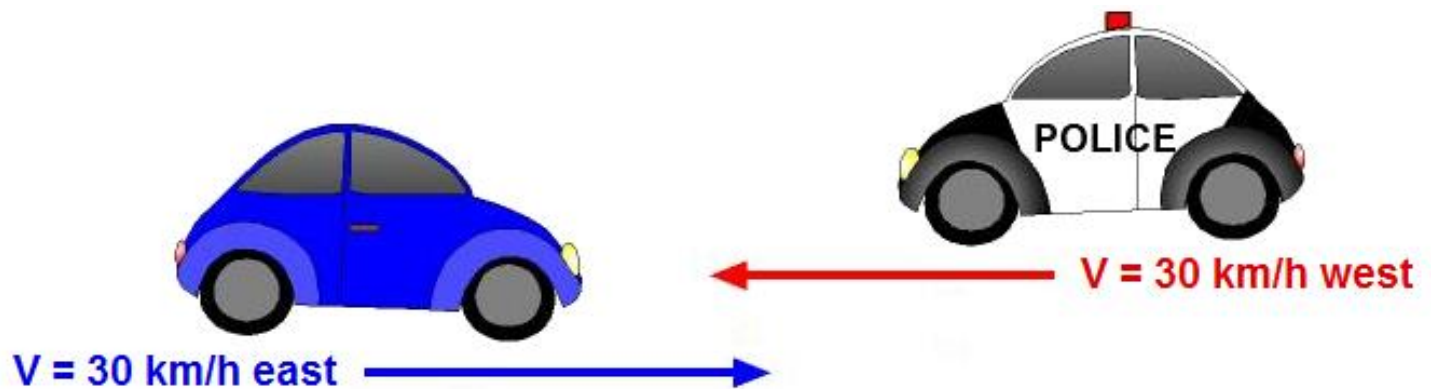
speed = $\frac{\text{distance}}{\text{time}}$

distance = time × speed

**Cover the measurement you are trying
to FIND**

Velocity

speed in a direction



Examples of velocity

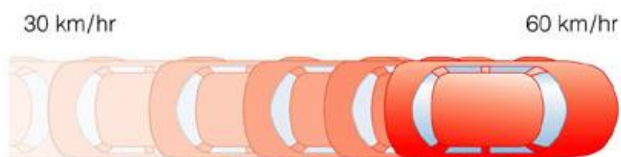
- 100 m/s north
- 65 km/h east

Acceleration

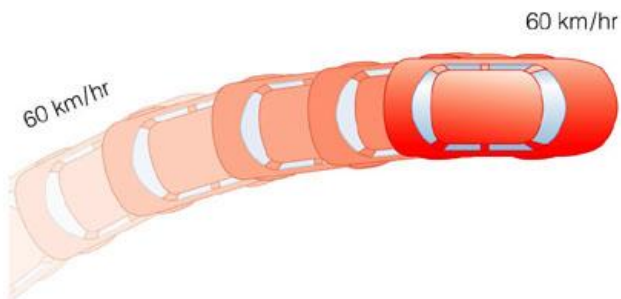
change in speed or direction

Examples of acceleration

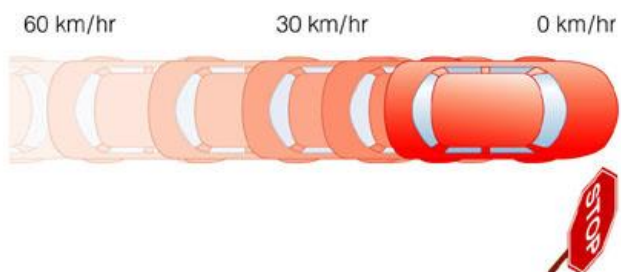
- speeding up
- slowing down
- changing direction



We say that this car is accelerating because its velocity is increasing.



We say that this car is accelerating because its direction is changing as it turns, which means its velocity is changing even though its speed stays constant.



We say that this car is accelerating because its velocity is decreasing. Decreasing velocity is still acceleration, although it is a negative acceleration.

A roller coaster is always accelerating because it is always changing speed and direction

Unbalanced forces cause acceleration



Acceleration is related to mass

the larger the mass of an object, the more force is needed to change its speed or direction



Small force = small acceleration



Large force = large acceleration

<http://www.brainpop.com/science/motionsforcesandtime/acceleration/>

Learning Objective: Through speaking and writing, SWBAT relate action and reaction forces, and list examples of each, using academic language.

Forces

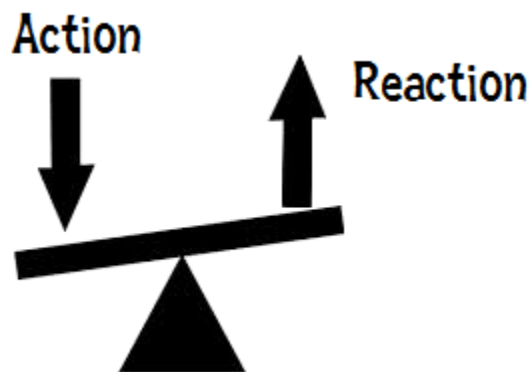
always happen in pairs

Action force

a force that is applied to an object

Reaction force

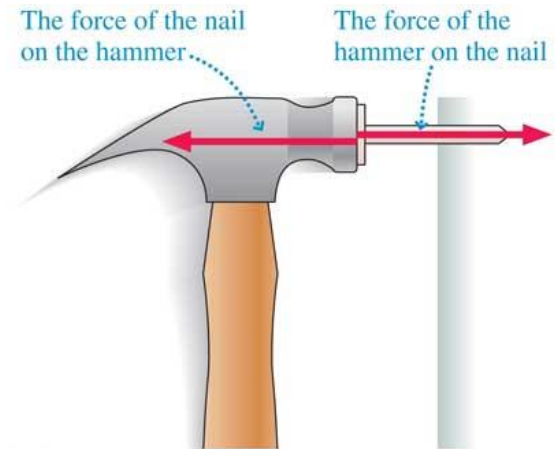
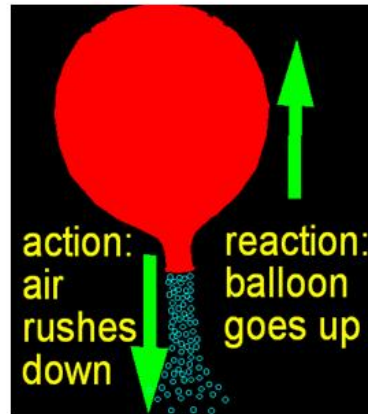
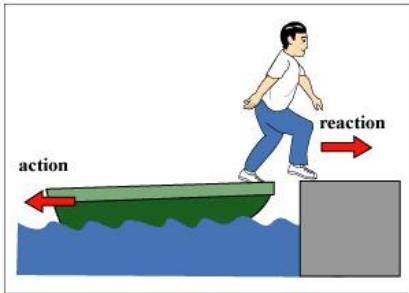
a force that acts in the opposite direction to the action force



Examples of action/reaction

- **ACTION**—the person pushes *on the boat* → **REACTION**—the boat *pushes back on the person*
- **ACTION**—the air moves *down* → **REACTION**—the balloon moves *up*

•**ACTION**—the hammer hits the nail → **REACTION**—the nail hits the hammer



Forces and Motion

Check Your Understanding

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1. Which pictures show motion?

The pictures that show motion are _____, _____, _____, _____ and _____.

2. What is velocity?

Velocity is _____.

3. What makes objects move?

_____ makes objects move.

4. What words can you use to describe an object's motion?

The words that you can use to describe an object's motion are _____, _____, and _____.

Learning Objective: Through speaking and writing, SWBAT explain Newton's laws of motion, and apply them to real world situations, using academic language.

Isaac Newton

a scientist who stated three laws of motion

Inertia

the tendency of an object to remain unchanged

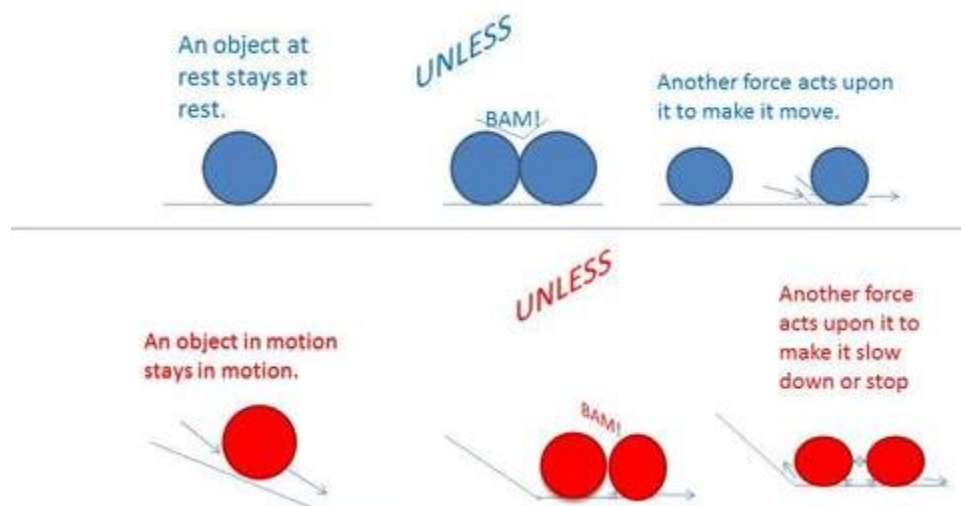
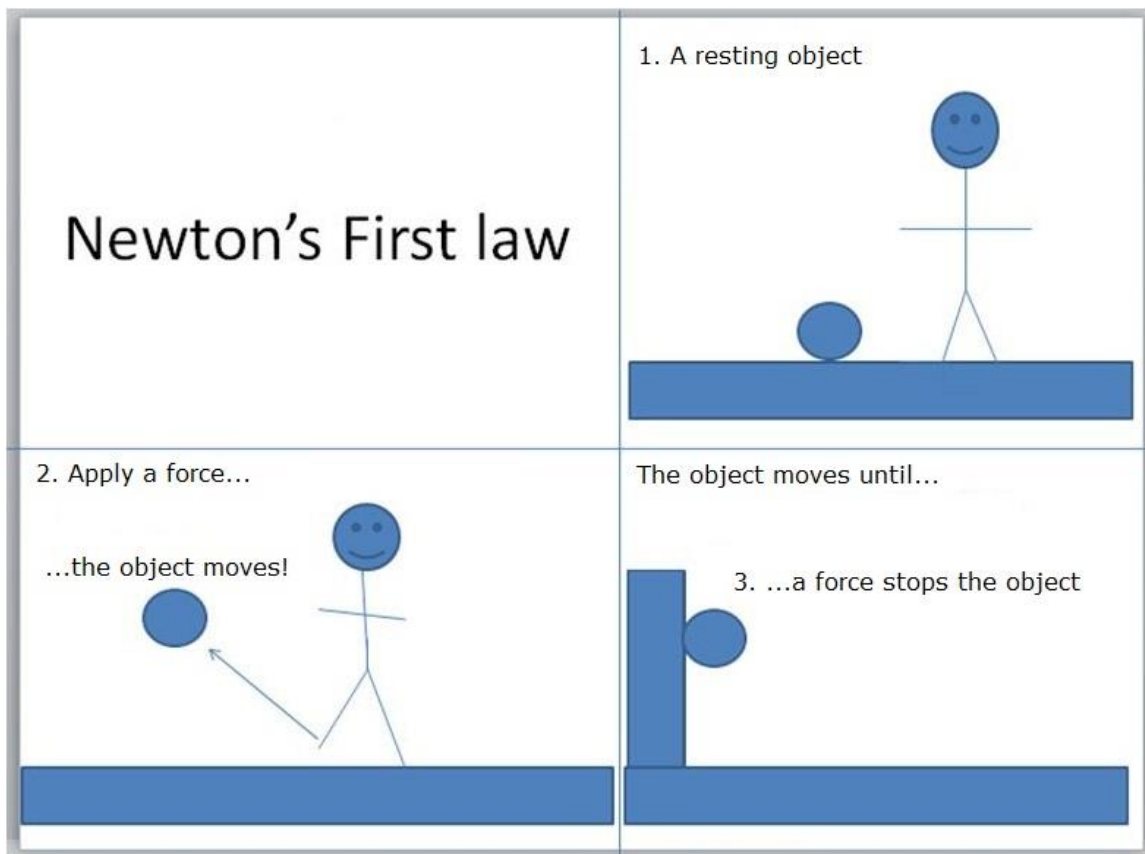
[i](http://www.absorblearning.com/media/item.action?quick=x)

[c](http://www.absorblearning.com/media/item.action?quick=x)

Newton's first law

an object that is at rest will stay at rest until an unbalanced force moves it; an object in motion will stay in motion until an unbalanced force changes its motion





<http://teachertech.rice.edu/Participants/louviere/Newton/law1.html>

Newton's second
law

more force causes more
acceleration

It also says that more force is
needed to move an object with
more mass

$$F \text{ (force)} = m \text{ (mass)} \times a \text{ (acceleration)}$$

$$F = ma$$

N kg m/s²



The more force...

The more acceleration.





Forces and Motion

Science Skill

Page 192

1. What is the force if the acceleration is 8 m/s/s and the mass is 5 kg ?

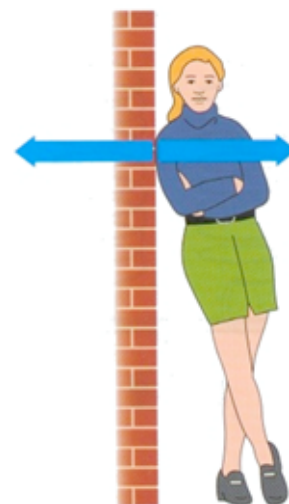
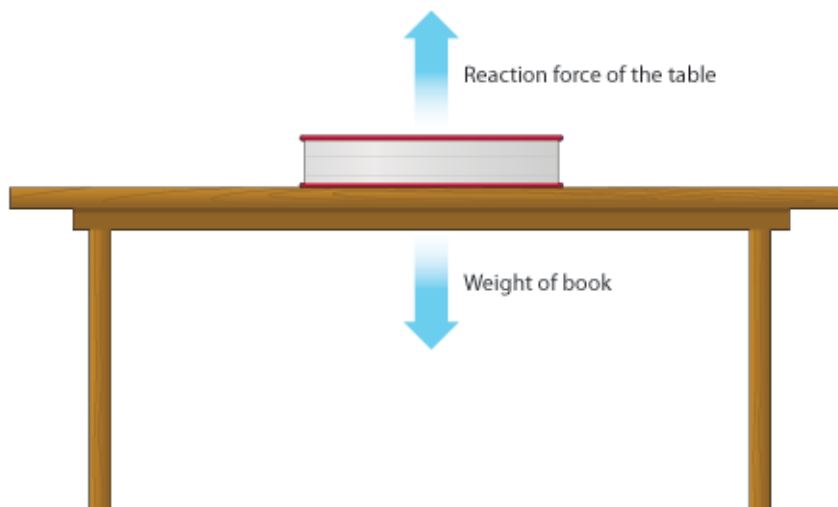
If the acceleration is 8 m/s/s and the mass is 5 kg , the force is _____.

2. What is the force if the acceleration is 10 m/s/s and the mass is 7 kg ?

If the acceleration is 10 m/s/s and the mass is 7 kg , the force is _____.

Newton's third law

for every action force, there is an equal and opposite reaction force



<http://www.brainpop.com/science/motionsforcesandtime/newtonsawsofmotion/>

Forces and Motion

Check Your Understanding

Page 193

1. What does Newton's first law say will happen to an object at rest?

Newton's first law says that an object at rest _____ .

2. If you increase the force on an object, what also increases?

If you increase the force on an object, the _____ also increases.

3. What two things are true about action and reaction forces?

The two things that are true about action and reaction forces are they are _____ and _____ .

4. When you push a door open, what is the action force? What is the reaction force?

When you push a door open, the action force is _____. The reaction force is _____ .